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10/705,676

11/10/2003

Ville Ruutu

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EXAMINER

CHANG, JULIAN

ART UNIT

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/705,676	<b>Applicant(s)</b> RUUTU ET AL.	
	<b>Examiner</b> JULIAN CHANG	<b>Art Unit</b> 2152	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 10 November 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>2/25/04</u> .   | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

1. This Office action is responsive to communication filed on 11/10/2003.

Claims 1-22 are pending, and have been examined. Claims 11 and 22 will be examined as independent claims, and charged as such.

#### ***Claim Rejections - 35 USC § 101***

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

2. Claim 11 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claim 11 claims software per se, which has been determined as unpatentable under 35 U.S.C. § 101. When functional descriptive material is recorded on some computer-readable medium, it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized. MPEP 2106.01. However, applicant claims functional descriptive material embodied on a storage structure, not a storage medium.

#### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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3. Claims 4-6 and 15-17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
4. Regarding claims 4, 6, 15 and 17, the formulas in the corresponding parent claims do not accurately estimate the upstream and downstream delays and capacities when, “instead of the uplink packets in the first and second exchange of packets differing in size, the downlink packets differ in size”. Moreover, the formulas become ambiguous because it is unclear which downstream packet size is referred to by the variable  $s_d$ .
5. Regarding claims 5 and 16, it is unclear what is represented by the variable  $d_r$ .

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

6. Claims 1, 2, 11, 12, 13 and 22 are rejected under 35 U.S.C. 102(a) as being anticipated by Kar (“Internet Path Characterization Using Common Internet Tools”, 2003).

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7. It should be noted that applicant uses the terms "uplink" and "downlink" simply as descriptive names relative to a sender and a receiver. Applicant has used the term "uplink" to mean from the receiver to the sender, and "downlink" to mean from the sender to the receiver. However, in Kar, the "upstream" direction is from the sender to the receiver.

8. Regarding claims 1, 11 and 12, Kar teaches a method, a computer program product implementing said method, and a system implementing said method, said method comprising:

a step in which the sender and receiver exchange a first pair of packets consisting of a first uplink packet and a first downlink packet and determine a round trip time for the exchange of the first pair of packets ('sends a packet of size S...returns a packet of size R', p. 126); and

a step in which the sender and receiver exchange a second pair of packets consisting of a second uplink packet and a second downlink packet and determine a round trip time for the exchange of the second pair of packets (Perl script for loop increments probe packet size (i.e., S) after each iteration, and runs traceroute (i.e., exchanges packets), p. 126);

wherein at least either the first and second uplink packets or the first and second downlink packets differ in size (Perl script for loop increments probe packet size (i.e., S) after each iteration, on p. 126).

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9. Regarding claims 2 and 13, Kar teaches repeating an exchange of a pair of packets between a sender and a receiver with at least either the first and second uplink packets or the first and second downlink packets differing in size (Perl script for loop increments probe packet size (i.e., S) after each iteration, p. 126), and the round trip times for the respective exchanges are also again determined ('#Gets all rtt's from traceroute program', p. 126), and the sender then determines processed round trip times for each of the exchanges by performing a statistical analysis of the round trip times for the respective exchanges (Figure 2 shows the graph after such minimum filtering (i.e., statistical analysis), pp. 126, 127).

10. Regarding claims 10 and 21, Kar teaches that at least one of the packets is used to convey information either of use in a predetermined protocol (response packets are ICMP, and would include information conveying that the protocol used is ICMP, p. 126), or of use in determining a receiver delay quantity indicating a delay between when the receiver receives the downlink packet and when the receiver transmits the uplink packet in response.

11. Regarding claim 22, Kar teaches a system, comprising a telecommunication network, and a sender device and a receiver device communicatively coupled thereby, the sender including an apparatus as claimed in claim 12 (traceroute to [www.tamucc.edu](http://www.tamucc.edu), p. 126).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 7-9 and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kar as applied to claims 1 and 12 above, and further in view of Vilalta, et al ("Predictive algorithms in the management of computer systems", 2002), hereinafter "Vilalta".

13. Regarding claims 7 and 18, Kar teaches estimating the capacities and delays of network links, but does not estimating capacities and delays based on already collected information and a dynamical quantity.

Vilalta teaches estimating a network variable, in this case httpops, based on already collected information and a dynamical quantity (p. 466, § "Removing mean and seasonal effects"). Vilalta teaches the use of data collected over a span of eight months to determine the effects of time of day, day of week, or even month of year on a network variable. By doing so, one could remove any seasonal effects from measurements of the network variable. It would have been obvious to apply such a technique to remove seasonal effects from measurements of another network variable, such as network delay.

It would have been obvious to one of ordinary skill in the art at the time of applicant's invention to apply the technique taught in Vilalta in order to remove mean and seasonal effects.

14. Regarding claims 8 and 19, Kar-Vilalta teaches the invention substantially as claimed and described in claims 7 and 18 above, including that the dynamical quantity is the time of day (Vilalta: p. 466, § "Removing mean and seasonal effects").

15. Regarding claims 9 and 20, Kar-Vilalta teaches the invention substantially as claimed and described in claims 7 and 18 above, including that the dynamical quantity is the time of day and the day of the week (Vilalta: p. 466, § "Removing mean and seasonal effects").

16. Claims 7-9 and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kar as applied to claims 1 and 12 above, and further in view of Schulz, et al ("Prediction of Communication Performance for Wide Area Computing Systems, 2001), hereinafter "Schulz".

17. Regarding claims 7 and 18, Kar teaches estimating the capacities and delays of network links, but does not estimating capacities and delays based on already collected information and a dynamical quantity.



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Schulz teaches estimating bandwidth and latency based on already collected information and a dynamic quantity (paragraph spanning pp. 482-483).

It would have been obvious to one of ordinary skill in the art at the time of applicant's invention to apply the technique taught in Schulz in order to more accurately estimate bandwidth and latency.

18. Regarding claims 8 and 19, Kar-Schulz teaches the invention substantially as claimed and described in claims 7 and 18 above, including that the dynamical quantity is the time of day (Schulz: p.483, same daytimes).

19. Regarding claims 9 and 20, Kar-Schulz teaches the invention substantially as claimed and described in claims 7 and 18 above, including that the dynamical quantity is the time of day and the day of the week (Schulz: p. 483, same weekdays).

20. Claims 3-6 and 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kar as applied to claims 1 and 12 above, and further in view of what was well known in the art at the time of applicant's invention.

21. Regarding claims 5 and 16, Kar teaches the invention substantially as claimed and described in claims 1 and 12 above, but fails to teach calculating uplink and downlink capacities,  $C_u$  and  $C_d$  using:

$$C_u = (s_{uA} - s_{uB}) / (t_A - t_B), \text{ and}$$

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$$C_d = s_d / [t_B - d_r - ((s_uB * (t_A - t_B)) / (s_uA - s_uB))].$$

Kar does however disclose that:

$$T_{SR} = S \sum_{i=1}^i \frac{1}{B_u(i)} + R \sum_{i=1}^i \frac{1}{B_d(i)} + K$$

where the sending host sends a packet of size S, and the receiving host returns a packet of size R, and K is the summation of propagation delays and processing delays (p. 126). Kar recognized that if the downstream packet size is constant, the equation simplifies, allowing one to calculate the upstream bandwidth as the inverse slope of RTT vs. upstream packet size (pp. 126, 127). One of ordinary skill in the art would have recognized from the teachings in Kar that if the upstream packet is kept constant instead, one could easily calculate the downstream bandwidth as the inverse slope of RTT vs. downstream packet size.

It would have been obvious to one of ordinary skill in the art at the time of applicant's invention to vary the uplink packet size instead of the downlink packet size in order to calculate the uplink bandwidth instead of downlink bandwidth.

Official notice is taken that one of ordinary skill in the art at the time of applicant's invention would have known that:

$$RTT = \text{uplink delay} + \text{downlink delay} + \text{receiver delay}$$

$$\text{Delay} = \text{packet size} / \text{bandwidth}$$

From the above formulas, that were well known, one can derive the following:

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$$RTT = (\text{uplink packet size} / \text{uplink bandwidth}) + (\text{downlink packet size} / \text{downlink bandwidth}) + \text{receiver delay}$$

$$(\text{downlink packet size} / \text{downlink bandwidth}) = RTT - (\text{uplink packet size} / \text{uplink bandwidth}) - \text{receiver delay}$$

$$\text{downlink bandwidth} = \text{downlink packet size} / [RTT - (\text{uplink packet size} / \text{uplink bandwidth}) - \text{receiver delay}]$$

It would have been obvious to one of ordinary skill in the art at the time of the invention to calculate the downlink bandwidth based on the measured uplink bandwidth and the receiver delay in order to avoid repeating the probe to calculate the downlink bandwidth.

22. Regarding claims 3 and 14, Kar teaches a sender determining for a packet of size S the uplink and downlink delays  $D_u$  and  $D_d$ , using:

$$D_u = S (t_A - t_B) / (s_{uA} - s_{uB}), \text{ and}$$

$$D_d = S [t_B - d_r - ((s_{uB} * (t_A - t_B)) / (s_{uA} - s_{uB}))] / s_d$$

Official notice is taken that one of ordinary skill in the art at the time of applicant's invention would have known that:

$$\text{Delay} = \text{packet size} / \text{bandwidth}$$

From this formula, and the formulas claimed in claims 5 and 16, one of ordinary skill in the art at the time of applicant's invention would have easily been able derive the formulas claimed in claims 3 and 14.

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It would have been obvious to one of ordinary skill in the art at the time of applicant's invention to calculate delay based on measured bandwidth in order to avoid the need to measure delay.

23. Regarding claims 4 and 15, Kar teaches, in view of what was well known in the art at the time of applicant's invention, the invention substantially as claimed and described in claims 3 and 14 above, including that instead of the uplink packets in the first and second exchange of packets differing in size, the downlink packets differ in size (Kar: pp. 126, 127).

24. Regarding claims 6 and 17, Kar teaches, in view of what was well known in the art at the time of applicant's invention, the invention substantially as claimed and described in claims 3 and 14 above, including that instead of the uplink packets in the first and second exchange of packets differing in size, the downlink packets differ in size (Kar: pp. 126, 127).

### ***Conclusion***

25. Any inquiry concerning this communication or earlier communications from the examiner should be directed to JULIAN CHANG whose telephone number is (571)272-8631. The examiner can normally be reached on Monday thru Friday 8am to 4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bunjob Jaroenchonwanit can be reached on (571) 272-

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3913. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. C./  
Examiner, Art Unit 2152

/Bunjob Jaroenchonwanit/  
Supervisory Patent Examiner, Art Unit 2152